Data Dictionary of 3.5 GHz Radar Waveforms

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Data description:

The dataset is divided into four groups. Each group consists of 50 files named as groupX_subset_Y.mat, where X is group number and Y is the subset number in the group. Each file includes 200 waveforms. The suggested split for the dataset is 35 %, 15 %, 50 % for training, validation, and testing, respectively (e.g., Group1 and Group2, for training and validation, and Group3 and Group4 for testing). The testing waveforms should be used for evaluating the overall accuracy as well as the ROC curves per SNR point. The following tables and figures demonstrate some parameters and statistics about the RF dataset.

Table 1. RF dataset specifications

RF dataset release version	1.0.0
Number of groups	4
Number of files per group	50
Number of waveforms per file	200
Average file size (bytes)	2 463 731 908.185
Total size of the RF data files (bytes)	492,746,381,637

Table 2. Variable name description.

Variable name	Description
groupX_waveformSubset_Y	IQ data in complex format
groupX_radarStatusSubset_Y	Logical vector, true if radar is present and false if radar is absent
groupX_waveformTableSubset_Y	MATLAB[1] table contains all generation parameters for the associated subset, can also be read from groupX_subset_CSVInfo\groupX_waveformTableSubset_Y.csv
FInfo	Release number, file unique id, and date/time of creation

How to cite the RF dataset
Caromi R, Souryal M, Hall T, RF dataset of the incumbent radar systems in the 3.5 GHz CBRS band.
Available online at: https://doi.org/10.18434/M32116

Table 3. Waveform basic parameters

Sampling rate (MHz)	10
Duration (ms)	80
Noise power density (dBm/MHz)	-109
Radar signal baseband center frequency	Random frequency shift (Hz) if the radar signal bandwidth is less than the sampling rate, zero Hz otherwise
Channel Model/Antenna pattern	None

Table 4. Waveform count by type.

Waveform type	Count
P0N#1 plus WGN	4000
P0N#2 plus WGN	4000
Q3N#1 plus WGN	4000
Q3N#2 plus WGN	4000
Q3N#3 plus WGN	4000
WGN only	20000

Table 5. Counts by SNR value for waveforms with radar signal presence.

SNR (dB)	Count
10	3290
12	3306
14	3288
16	3252
18	3458
20	3406

[1]Certain commercial equipment, instruments, or materials are identified in this paper to foster understanding. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.

Table 6. Metadata: Description of generation parameters

Generation parameters	Description
BinNo	Type of pulse modulation
PulseWidth	Radar signal pulse width (s)
PulsesPerSecond	Number of pulses per second of the radar signal
PulsesPerBurst	Number of pulses of the radar signal in the waveform
ChirpWidth	Chirp width (Hz) for linear frequency modulated (FM) radar signals. Valid for Q3N#1, Q3N#2, and Q3N#3 bins only.
ChirpDirection	Whether the frequency of the FM signal is increasing or decreasing, i.e., UP or Down. Valid for Q3N#1, Q3N#2, and Q3N#3 bins only.
SamplingFrequency	Sampling rate (Hz) of the waveform.
ActualPulseWidth	The actual pulse width for radar signal used during generation. May slightly differ from PulseWidth for some signals.
PhaseCodingType	Phase coding type for bin P0N#2
SUID	Unique identifier for waveforms with radar signals
radarStatus	Boolean value to indicate whether the radar signal is present or absent
radarSignalCenterFreq	Baseband center frequency (Hz) of the radar signals
radarSignalStartTime	Start time (s) of the radar signal
SNR	Peak signal to noise ratio of the radar signal
NoisePowerdBmPerMHz	Noise power of the white Guassian noise in dBm per 1 MHz
duration	Total duration (s) of the waveform

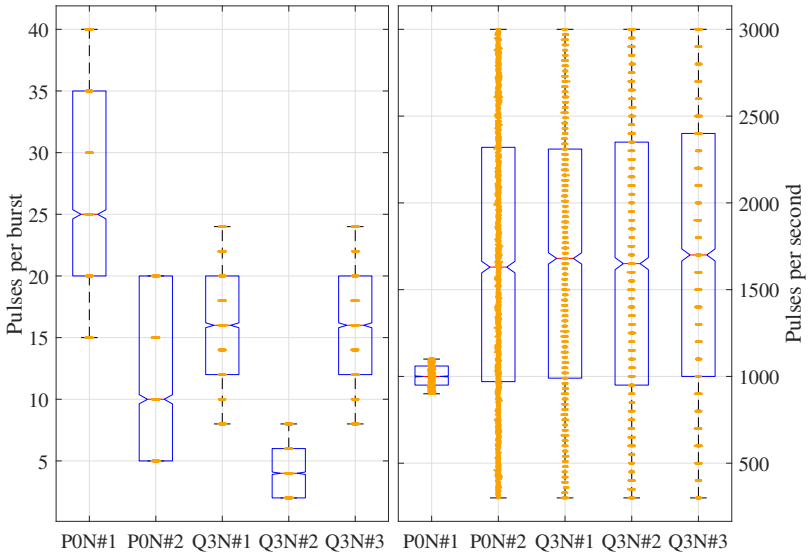

Fig. 1. Boxplots of pulses per burst and pulses per second for each waveform bin. The orange marks represent where the data points fall in the intervals.

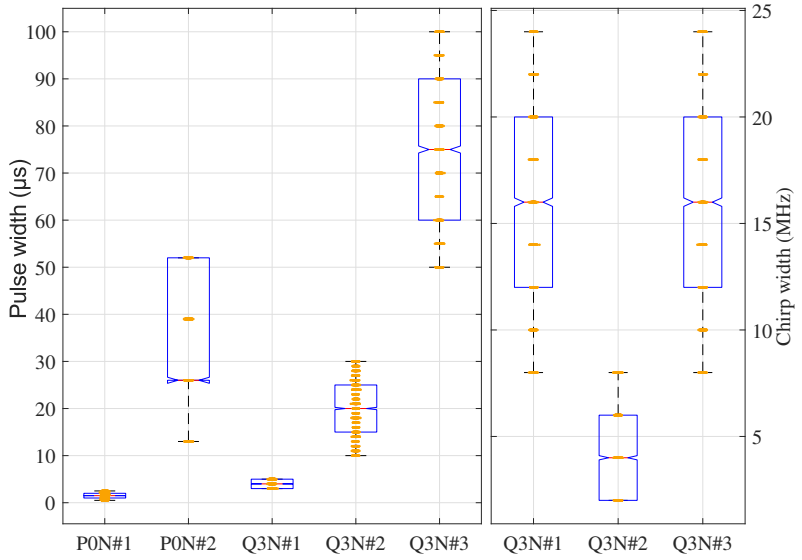

Fig. 2. Boxplots of pulse width and Chirp width for waveform bins. Chirp width is only valid for linear frequency modulated (LFM) bins. The orange marks represent where the data points fall in the intervals.